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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|-----------------------------|------------------|
| 10/626,550 | 07/25/2003 | Se-Yeul Bae | 009844-0305239 | 9321 |
| 909 | 7590 | 07/14/2004 | EXAMINER | |
| PILLSBURY WINTHROP, LLP P.O. BOX 10500 MCLEAN, VA 22102 | | | MALSAWMA, LALRINFAMKIM HMAR | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2825 | |

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | | |
|------------------------------|------------------------|--|---------------------|--|
| Office Action Summary | Application No. | | Applicant(s) | |
| | 10/626,550 | | BAE, SE-YEUL | |
| | Examiner | | Art Unit | |
| | Lex Malsawma | | 2825 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Jul. 25, 2003 through Nov. 5, 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>20030725</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Aoki (6,387,821).

Regarding claims 1-8:

Aoki discloses (in Figs. 1-4 and Col. 8, lines 18-65) a method of forming metal wiring in a semiconductor device comprising:

forming a bottom metal pattern 105 on a semiconductor substrate (Col. 8, lines 4-5);

forming an insulating layer 106 on the semiconductor substrate including the bottom metal pattern, wherein a low-temperature oxide (HSQ) is formed at the temperature of 150-400 °C (Col. 8, lines 23-27) and having a thickness of 1200 nm (12000 Å);

forming a first photoresist pattern 107 (Fig. 2a) for forming via hole on the insulating layer 106;

forming an unfinished via hole by removing the insulating layer selectively for a prescribed thickness using the first photoresist pattern as a mask (Fig. 2b);

removing the first photoresist pattern 107 (Figs. 2a-2b);

forming a second photoresist pattern 108 for forming damascene pattern on the insulating layer around the unfinished via hole (Fig. 3a);

forming a damascene pattern by removing the insulating layer 106 selectively using the second photoresist pattern as a mask (Fig. 3b), wherein the unfinished via hole is formed to make the thickness of the insulating layer 106 remaining inside the via hole equal to the thickness of the upper part of the damascene contact (i.e., the thickness of remaining insulating layer 106 below the unfinished via in Fig. 3a is equal to the thickness of the upper part of the damascene opening in Fig. 3b);

removing the second photoresist pattern 108 (Figs. 3a-3b); and

forming a metal-wiring-via-damascene contact 111 by filling metal 111 (copper) in the damascene pattern, wherein the damascene contact is formed by dry deposition (i.e., sputtering) of metal on the insulating layer including the damascene pattern and the planarizing the metal 111 by CMP process (Figs. 4a-4b and Col. 8, lines 58-65).

Therefore, claims 1-8 are anticipated.

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The references listed on the attached Form PTO-892 are cited to show methods of forming damascene contacts wherein an unfinished via is first etched using a first photoresist mask, followed by a second etch using a second photoresist mask to form a damascene opening.

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4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lex Malsawma whose telephone number is 571-272-1903. The examiner can normally be reached on Mon-Thu (1 PM - 9:30PM EST) and Sat.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lex Malsawma



July 10, 2004



MATTHEW SMITH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800